ECM group

February 22, 2006

Peter Van Alyea
Redwood Oil Company
P.O. Box 428
Santa Rosa, CA 95402

Re: Workplan for Dual Phase Extraction Pilot Test
7716 Old Redwood Highway
Cotati, CA
ECM Project # 98-516

Dear Mr. Van Alyea:

ECM has prepared this workplan to conduct a Dual Phase Extraction (DPE) pilot test at the above referenced site (Figures 1 and 2, Appendix A). Preparation of this DPE workplan was proposed in the November 17, 2005 Revised FS/CAP. Details of site history, a Site Conceptual Model (SCM), and tables summarizing cumulative site data are provided in the FS/CAP. Following the conclusion of the DPE pilot test, an FS/CAP addendum will be prepared addressing the items requested in the December 27, 2005 Sonoma County Letter.

The purpose of the proposed DPE pilot test is to collect site-specific data in order to assess the cost-effectiveness and technological feasibility of a DPE system. In the event that DPE is selected as the most cost-effective and technologically feasible remedial alternative for the site, data from the DPE pilot test will be used for system design. The pilot test will be used to estimate future contaminant removal rates, water removal rates, system design, radius of influence, and induced vacuum.

The following outlines the scope of work and procedures to be used for this pilot test:

Task 1 - Site Safety Plan

Using available site history information, ECM will prepare a site-specific safety plan. The site safety plan (SSP) identifies potential site hazards and specifies procedures to protect site workers. The SSP will be on-site during field operations.

Task 2 - Extraction Well/Piezometer Installation

One extraction well (EX-1) and two piezometers (PZ-1 and PZ-2) will be installed at the locations shown on Figure 2 (Appendix A). EX-1 will be a 4-inch diameter well installed to a depth of 35 ft bgs. PZ-1 and PZ-2 will be two-inch diameter wells installed to a depth of 25 ft bgs. EX-1 will be used as an extraction well during the pilot test. PZ-1 and PZ-2 will be used as observation wells. EX-1 will be incorporated as a remedial extraction well in the final system design.

Prior to drilling, utilities will be located by USA and a private underground utility detection company. EX-1, PZ-1, and PZ-2 will be drilled by a California licensed drilling contractor. Soil samples will be collected in pre-cleaned tubes in accordance with ECM Standard Operating Procedure - Soil Sampling (Appendix B).

The wells will be logged in accordance with ECM Standard Operating Procedure - Logging Method (Appendix B). The wells will be drilled under the supervision of a California Registered Engineer. The soil samples will be field screened with an OVM in accordance with ECM Standard Operating Procedure - OVM Readings (Appendix B). The wells will be constructed in accordance with ECM Standard Operating Procedure - Monitoring Well Design and Construction (Appendix B).

All drilling equipment will be steam-cleaned prior to use, and all sampling equipment will be washed between samples using EPA-approved detergent (Liquinox) and rinsed with potable water.

Task 3 - Soil Analysis

In order to provide additional site characterization data, soil samples will be collected from EX-

1, PZ-1, and PZ-2 at significant changes in soil type, in obviously contaminated soils, and at the soil/groundwater interface. Soil samples will be collected at 5-foot minimum intervals and analyzed for TPPH(G), TPH(D), (BTEX), and MTBE.

Task 4 - Conduct Pilot Test

A vacuum will be induced in EX-1 by means of a mobile unit consisting of a liquid-ring pump and furnace. Vacuum pressure, drawdown, liquid and vapor flow-rate, and concentration data for vapor and liquid effluent will be collected from EX-1. Drawdown data and vacuum influence data will be collected from the observation wells PZ-1, PZ-2, and MW-3 (located approximately 5 ft, 12 ft, and 20 ft respectively from EX-1). Drawdown data from the observation wells will be used to calculate hydrologic conductivity, transmissivity, and radius of influence. Vacuum influence data will be used to calculate relative soil permeability for vapor flow, and radius of influence.

Liquid effluent will be stored on-site in a storage tank pending discharge via carbon filtration vessels, under appropriate permit, to the sanitary sewer, or transportation to an appropriate disposal facility. Vapor effluent will be destroyed in the mobile unit furnace. Effluent from the furnace will be vented to the atmosphere under permit from Bay Area Air Quality Management District (BAAQMD). In accordance with BAAQMD requirements, duration of the pilot test will be no longer than five days.

Task 5 - Report

A report will be submitted with the results of the pilot test. On the basis of pilot test results, an FS/CAP Addendum will be prepared for the site. The FS/CAP Addendum will include a final analysis of remediation alternatives and will present a final recommendation for site remediation. If DPE is selected as the most cost-effective and technologically feasible remedial

alternative for the site, data from the DPE pilot test will be used for system design. The FS/CAP Addendum will also include the items requested in the December 27, 2005 Sonoma County letter.

Thank you for allowing ECM to provide environmental consulting services. Please call if you have questions or require additional information.

Sincerely,
ECM Group

Dave Hazard
Staff Scientist

Jim Green
Professional Engineer #C58482

Attachments:
Appendix A - Figures
Appendix B - ECM Standard Operating Procedures

cc: Darcy Bering, Sonoma County Department of Health Services

APPENDIX A
FIGURES

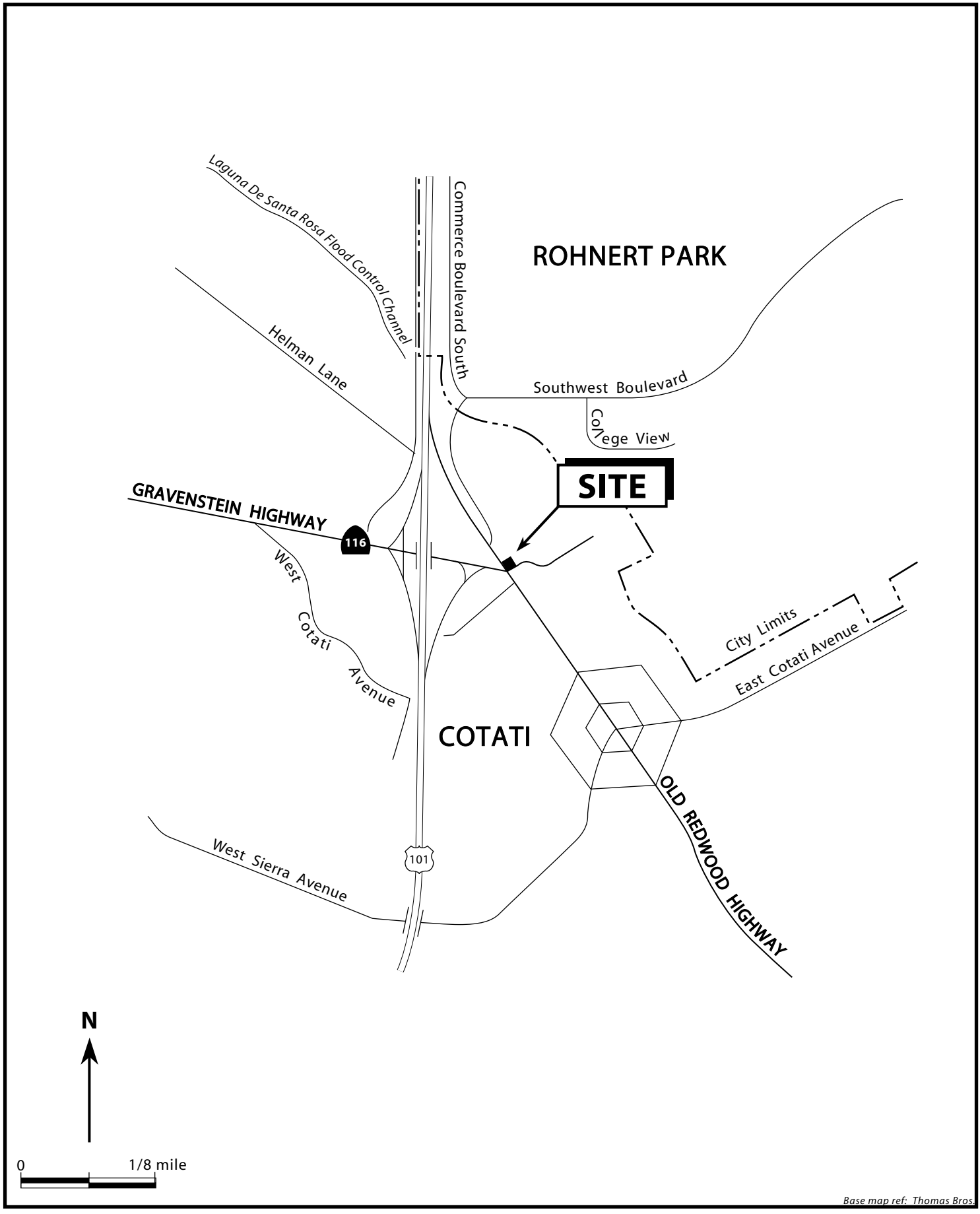

Figure 1. Site Location Map – Redwood Oil Service Station #102, 7716 Old Redwood Highway, Cotati, California

98-516 [site loc map] 10-03

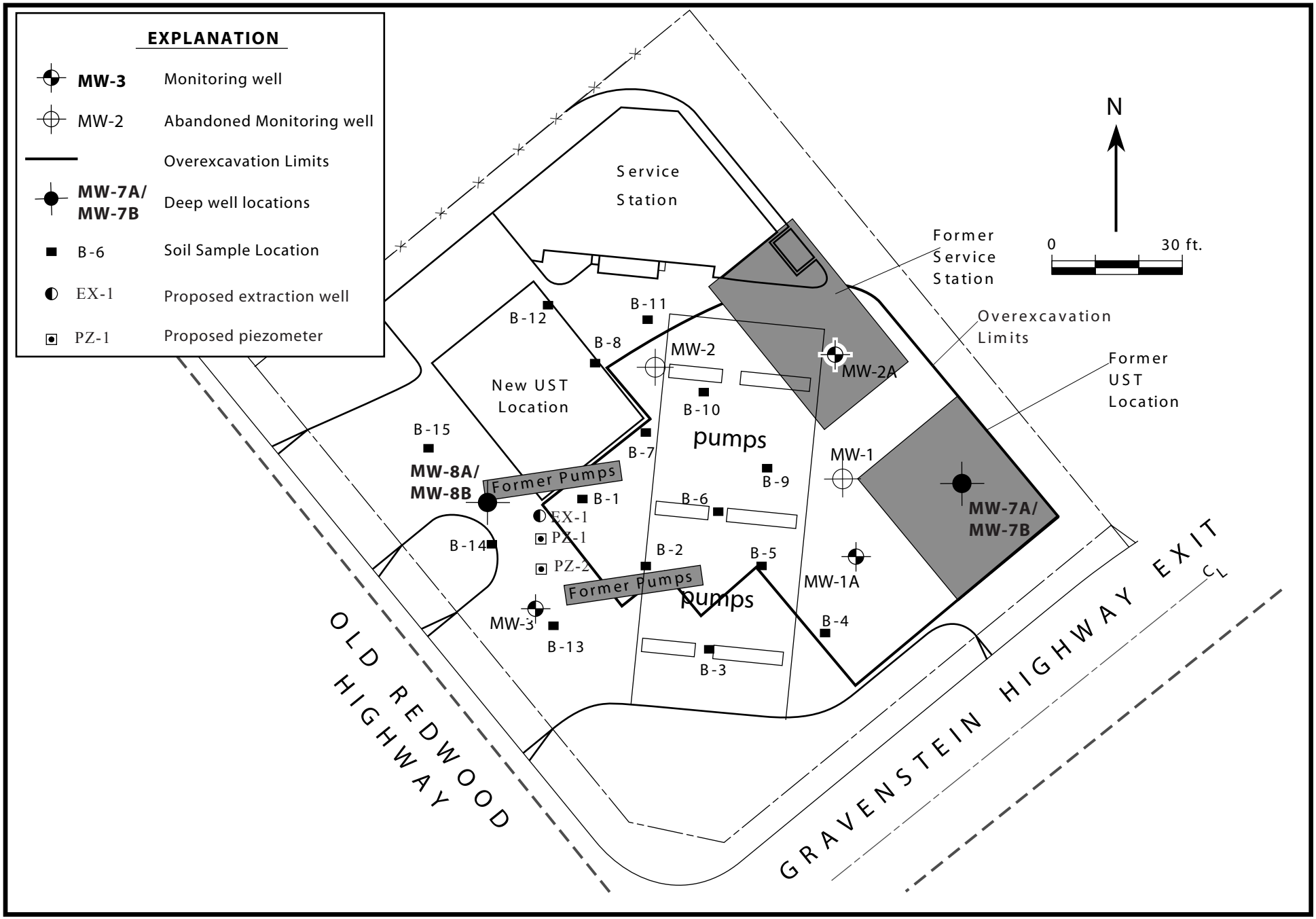

Figure 2. Site Plan and Proposed Locations for Extraction Well/Piezometers – Redwood Oil Service Station #102, 7716 Old Redwood, Cotati, California

98-516-22 [Figure 7] 2/09/06

APPENDIX B
ECM STANDARD OPERATING PROCEDURES

ECM STANDARD OPERATING PROCEDURE
SOIL SAMPLING - HOLLOW STEM AUGER DRILLING METHOD OR HYDRAULIC DIRECT-PUSH METHOD

The following describes sampling procedures used by ECM field personnel to collect, handle, and transport soil samples. Before samples are collected, careful consideration is given to the type of analysis to be performed so that precautions are taken to prevent loss of volatile components or contamination of the sample, and to preserve the sample for subsequent analysis.

All drilling and sampling equipment is steam-cleaned between boreholes to prevent cross-contamination. The sampler is washed with an EPA approved detergent (such as liquinox or trisodium phosphate) between sample collection. Collection methods specific to soil sampling are presented below.

Soil samples are collected at pre-specified depth intervals or at a sediment/lithologic change for hydrogeologic description and possible chemical analysis. If hydraulic direct-push methods are used, the soil sample is collected using appropriate direct-push equipment. If hollow-stem augers are used, samples are collected using a modified California split-barrel sampler lined with 2- or 2.5-inch I.D. x 4- or 6-inch long steam-cleaned or new stainless steel or brass tubes or poly-vinyl liners. The sampler is lowered into the borehole and driven 18 inches, using a 140-pound hammer falling 30 inches. The drilling contractor provides the ECM field personnel with the number of blows required to drive the sampler for each 6 inches of penetration.

The sampler is then extracted from the borehole and the middle or bottom brass tube is carefully removed for possible analysis. The soil material is immediately trimmed flush with the tube ends, and sealed with Teflon tape beneath polyethylene end caps. The sample is then labeled to include the date, boring number, depth of sample, project number, ECM, and the ECM field personnel's initials. The samples are put into a resealable plastic bag and placed into an ice chest maintained below 4˚C with blue ice or dry ice, for transport under chain of custody to the laboratory. The chain-of-custody form includes the project number, analysis requested, sample ID, date analysis and the ECM field personnel's name. The form is signed, dated and timed by each person who yields or receives the samples beginning with the field personnel and ending with the laboratory personnel.

ECM STANDARD OPERATING PROCEDURE

LOGGING METHOD

Unconsolidated soil is classified and described by trained ECM field personnel. All available information is used, including the following: soil recovered in the sampler, including the soil visible on both ends of the sample retained for possible analysis; soil cuttings generated during drilling; and the drilling contractor's observations of the drill rig's behavior.

Classification and description of unconsolidated soil is accomplished using the American Society of Testing and Materials (ASTM) Methods D2487-85 (Unified Soil Classification System (USCS)) and/or D2488-69 (Description and Identification of Soils (Visual-Manual Procedure)).

The soil classification and description is recorded on the field log sheet by ECM field personnel and includes the following information:

1) Soil type;
2) Soil classification;
3) Soil color, including mottling;
4) Moisture content;
5) Plasticity and consistency (fine-grained material) or density (coarse-grained material);
6) Percentages of clay, silt, sand and gravel;
7) Grain size range of sands and gravels;
8) Angularity and largest diameter of gravel component;
9) Estimated permeability;
10) Odor; and

11)Any other observations which would assist in the interpretation of the depositional environment and/or differentiation between the various geologic units expected to be encountered.

In addition to the above, the ground water levels encountered during drilling and measured after the water stabilized is also recorded on the field log.

ECM STANDARD OPERATING PROCEDURE

OVM READINGS

ECM uses an organic vapor meter (OVM) to determine the presence or absence of volatile organic compounds (VOCs), including benzene, toluene, ethylbenzene, and xylenes in soil samples chosen for field screening. The OVM uses a photoionization detector (PID) and is calibrated daily to 100 parts per million of 1-liter of isobutylene. The OVM, which measures in parts per million by volume (ppmv), is used for qualitative, not quantitative, assessment because the correlation between the volume measurements of the OVM and the weight measurements of the laboratory instruments is not well defined.

A field screen sample is obtained from the brass tube immediately above or below the brass tube containing the sample selected for possible analysis. The soil to be screened is removed from the brass tube, and is placed in a pre-cleaned brass tube with aluminum foil and a polyethylene cap on one end. The brass tube is loosely filled to approximately 1/2 full. Another square of aluminum foil is placed on the open end and a polyethylene cap with crossed slits is placed over it.

The field screen sample is allowed to temperature equilibrate for approximately 15 to 30 minutes in the sun, allowing any VOCs which might be present in the soil to volatilize out into the brass tube's headspace. The OVM nozzle is then placed inside the sealed brass tube, through the slits in the cap, in order to measure the VOCs present, if any, in the headspace. The nozzle should remain inside the brass tube for approximately 15 to 30 seconds or until the maximum reading has been recorded on the OVM readout panel.

The depth from which the sample came and the corresponding OVM reading is recorded on the original field log sheet. Field observations, OVM and (odor and staining) readings are used in determining which soil samples are to be analyzed in the laboratory.

ECM STANDARD OPERATING PROCEDURE

MONITORING WELL DESIGN AND CONSTRUCTION

Where possible, information from published and unpublished reports is reviewed prior to installation of monitoring wells. Relevant data includes highest and lowest anticipated ground water elevations, aquifer materials, aquifer yield and contaminants expected. This information is used to aid the field geologist rather than to predetermine how the wells will be constructed. Well construction is based on *site specific conditions* and is determined in the field after discussion with the senior geologist.

Monitoring wells are constructed with flush-threaded, 2-inch or 4-inch diameter, slotted PVC, stainless steel or teflon well screen and PVC, stainless steel or teflon blank casing. Number 3 or #212 sand is used in the annular space around the well screen. The sand is placed into the annular space around the well screen to approximately 2 feet above the top of the well screen. If high ground water conditions exist, the sand may be placed 0 to 1 foot above the top of the well screen. Two feet of bentonite pellets are used to separate the sand from the sanitary surface seal (grout). If high ground water conditions exist 1/2 foot of bentonite may be used to separate the sand from the sanitary surface seal.

The grout (Portland cement with approximately 3-5% bentonite powder) is poured into the annular space above the bentonite pellets. If the surface seal is greater than 5 feet thick, grout consisting of cement mixed with 3-5% bentonite powder will be tremied or pumped into the annular space above the bentonite pellets to prevent the infiltration of surface water into the well. If the surface seal is less than 5 feet thick, the grout will be poured from the surface. The resulting seal will be checked for shrinkage within 24 hours and additional grout will be added, if necessary. The surface seal is used to prevent infiltration of surface water into the well.

The monitoring well(s) is locked with a stovepipe or cap and covered with a traffic-rated vault if it is located in a developed area. The well ID is clearly marked on the cap or casing.